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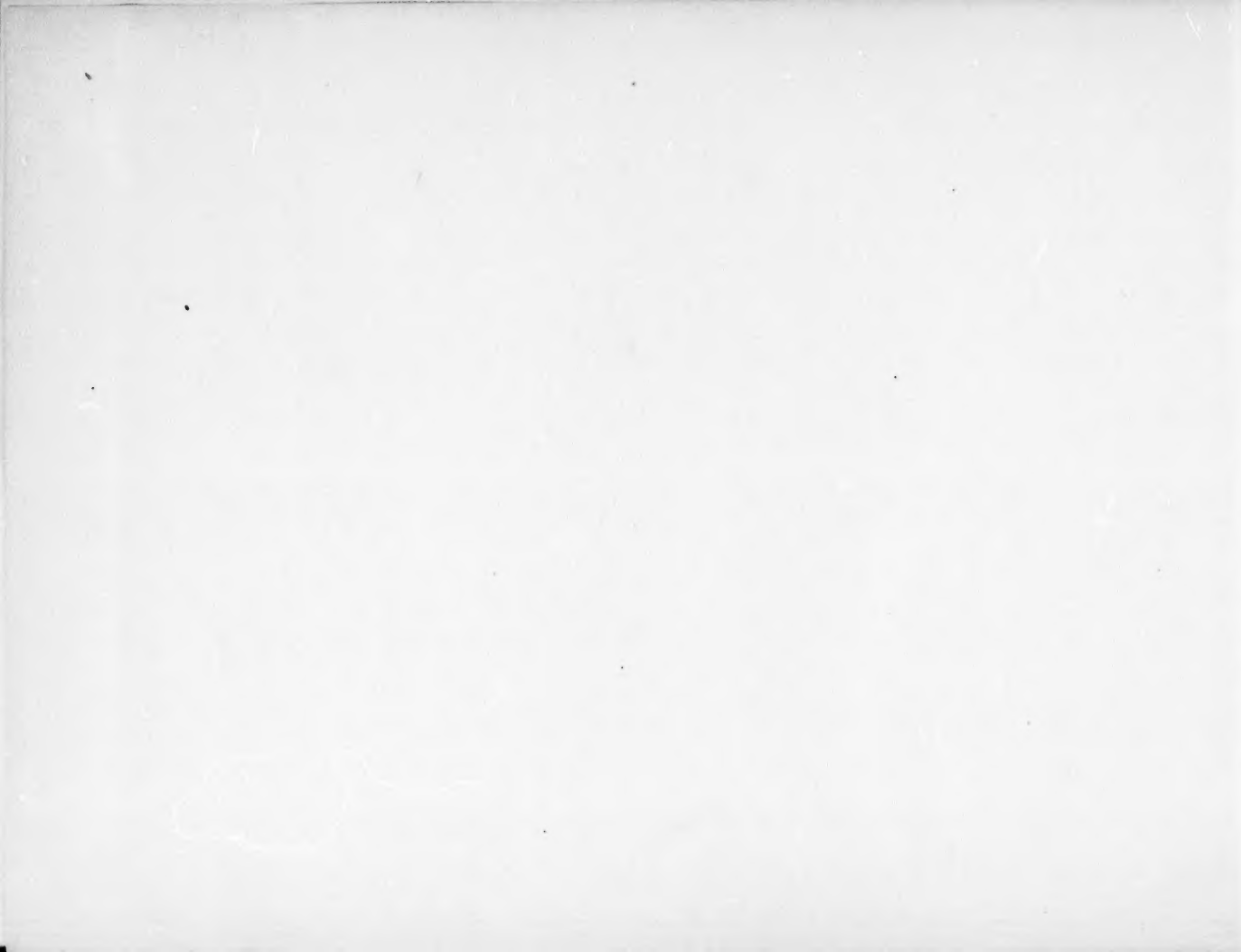
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OUTLINES
OF
CLASSIFICATION OF PLANTS,

BY

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OUTLINES OF CLASSIFICATION.

Synopsis.

Branch I.—Protophyta.

CLASS 1.—MYXOGASTRES, (Slime Moulds.)

Orders—Peritrichæ.
Columelliferæ.
Lithodermææ.
Calotrichææ.

CLASS 2.—SCHIZOPHYCEÆ, (Fission Fungi)

Orders—Myxobacteriaceæ.
Cystiphoræ.
Nematogenææ.

From the nature of the organisms included in the protophyta, is improbable that many of them will ever be found in the fossil state, although Renault claims to have recognized several species of bacteria in the tissues of carboniferous plants.

Branch II.—Thallophyta.

CLASS 3.—ASCOMYCETES, (Sac Fungi)

Orders—Perisporiaceæ.
Tuberaceæ.
Pyrenomycetææ.
Discomycetææ.
Uredineæ.
Ustilagineæ.
Sphaeropsidææ.
Melanconiceæ.
Hyphomycetææ.

Fossil representatives occur in the carboniferous and later formations, chiefly upon leaves and in lignite.

CLASS 4.—BASIDIOMYCETES, (Higher Fungi.)

Orders—Gasteromycetææ.
Hymenomycetææ.

Fossil representatives occur in the carboniferous, *Grilletia*, *Peridermium*, *Gastromyces farinosus*, etc.

CLASS 5.—CHLOROPHYCEÆ, (Green Algae.)

Orders—Protozoocoidææ.
Conjugatææ.
Siphoniææ.
Confervoidææ.

Fossil representatives, in the form of siliceous diatom valves, are especially abundant in the Tertiary and Quaternary, often forming extensive deposits known under the name of infusorial earth.

CLASS 6.—PHLEOPHYCEÆ, (Brown Algae.)

Orders—Phaeosporææ.
Dictyotææ.
Fucoidææ.

The earliest fossil representatives of the brown algae occur in the Upper Silurian whence they pass into the Lower Devonian. They appear in these early formations as plants of great size (*Nematophyton*), indicating that they must also have flourished at much earlier periods, but the remains of the vegetation which existed prior to the Upper Silurian are now represented only by a carbonaceous residue in the form of graphite. Phaeophyceæ are found more or less abundantly in all the later formations, and the genus *Fucus* is well defined in the Cretaceous.

CLASS 7.—COLEOCHETEÆ.

Order—Coleochetaceæ.

No fossil representatives known.

CLASS 8.—RHODOPHYCEÆ.

Order—Floridææ.

Fossil representatives from the Silurian upward, and especially abundant in the Cretaceous.

CLASS 9.—CHAROPHYCEÆ.

Order—Characeæ.

Represented by many species in the lower Cretaceous, in the Tertiary and Quaternary.



Synopsis.—(Continued.)

Branch III.—Bryophyta.

CLASS 10.—HEPATICE.

Orders—Jungermanniaceæ,
Ricciaceæ,
Anthocerotaceæ,
Marchantiaceæ.

Found only in recent formations—Tertiary and Quaternary.
Larchantia.

CLASS 11.—MUSCINE.

Orders—Sphagnaceæ,
Andreaceæ,
Phascaceæ,
Bryaceæ.

Fossils found only in the Tertiary and Quarternary. *Gymnomium*, *Sphagnum*, *Hypnææ*.

Branch IV.—Pteridophyta.

CLASS 12.—FILICINE.

Orders—Filices.
Salviniaceæ,
Marsiliaceæ,
Ophioglossaceæ,
Marattiaceæ.

Fossil representatives numerous from the Devonian (*Parka*, *Pretosalvinia*, *Neuropteris*, *Sphenopteris*, etc.) through the carboniferous to recent formations.

CLASS 13.—EQUISETINE.

Orders—Equisetaceæ,
Calamitæ,
Annulariæ,
Asterophyllitæ.

Fossil representatives numerous from the Devonian (*Calamites*, *Asterophyllites*, etc.) and throughout the carboniferous.

CLASS 14.—SPHENOPHYLLÉE.

Order—Sphenophyllaceæ.

Fossil representatives in the Siluro-Cambrian and upward.

CLASS 15.—LYCOPODINE.

Orders—Lycopodiaceæ,
Psilotaceæ,
Selaginellaceæ,
Isoetaceæ.

Fossil representatives numerous and often very large, from the Upper Silurian (*Psilophyton*, etc.) through the Devonian (*Leptodendron*) and Carboniferous.

Branch V.—Spermaphyta.

CLASS 16.—GYMNOSPERME.

Orders—Cycadaceæ,
Conifereæ,
Taxaceæ,
Gnetaceæ.

Fossil representatives very numerous from the Devonian (*Dadoxylon*, *Cordaites*, etc.) and through the Carboniferous and more recent formations.

CLASS 17.—ANGIOSPERME.

Sub-Class 1.—Monocotyledons.
Sub-Class 2.—Dicotyledons.

Orders numerous.

Fossil representatives are very numerous as leaves, lignite, &c., from the Permian upward, becoming more numerous in recent formations.

NOTES.



Phases of growth.

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BRANCH II.—Thallophyta.

NOTES.

Unicellular or multicellular plants, the latter often with a stem-like habit of growth.
Sexual generation predominant.

III. ASCOMYCETES. (Sac Fungi.)	IV. BASIDIOMYCETES. (Higher Fungi)	V. CHLOROPHYCEAE. (Green Algae)	VI. PHAEOPHYCEAE. (Brown Algae)	VII. COLEOPHYCEAE.
<i>Orders.</i>	<i>Orders.</i>	<i>Orders.</i>	<i>Orders.</i>	<i>Order.</i>
1. Perisporiaceae. 2. Tuberoideae. 3. Pyrenomycetaceae. 4. Discomycetaceae. 5. Uredinales. 6. Ustilaginaceae. 7. Sphaeropsidaceae. 8. Melanconiaceae. 9. Hyphomycetaceae.	1. Gasteromycetaceae. 2. Hymenomycetaceae.	1. Protococcoidae. 2. Conjugatae. 3. Siphonaceae. 4. Confervoidae.	1. Phaeosporaceae. 2. Dictyotaceae. 3. Fucoideae.	1. Coleochaetaceae.
Asexual reproduction commonly predominant.	Asexual reproduction predominant	Sexual reproduction often by conjugation with the formation of Zygospores. Asexual reproduction predominant.	Reproduction wholly sexual in Fucoaceae, asexual in Phaeosporaceae and Dictyotaceae.	Asexual reproduction by swarm spores often predominant.
1. Perfect plant ♂.		1. Perfect plant ♂	1. Perfect plant ♂ or ♀	1. Perfect plant ♂
2. Antheridia ♀.		2. Antheridia ♀	2. Antheridia ♀	2. Antheridia ♀
		3. Spermatozooids.	3. Spermatozooids.	3. Spermatozooids.
1. Perfect plant ♀.		1. Perfect plant ♀	1. Perfect plant ♀ or ♂	1. Perfect plant ♀
II. Archicarpus ♀.		II. Oogonium.	II. Oogonia ♀	II. Oogonium
	No clearly defined sexual reproduction known.	III. Oosphere (Ovum) ♀	III. Oospheres (Ova).	III. Oosphere (Ovum)
3 x III. Ascus.		4 x IV. Oospore.	4 x IV. Oospore.	4 x IV. Oospore.
4 x IV. Spores.		5 x V. Swarm spores		5 x V. Swarm spores.



BRANCH III—Bryophyta.

Cellular plants with roots, epidermis and stomata,
often with leafy stems,
Sexual generation predominant.

Thallophyta.—(Continued.)

II. RHODOPHYCEÆ | IX. CHAROPHYCEÆ.

(Red Seaweeds.)

Order.

Order.

Florideæ.

1. Characeæ.

X. HEPATICE.

(Liverworts.)

Orders

1. Jungermanniaceæ.
2. Ricciaceæ.
3. Anthocerotaceæ.
4. Marchantiaceæ.

XI. MUSCINEÆ.

(Mosses.)

Orders.

1. Splachnaceæ.
2. A. ~~complanata~~
3. Phascaceæ.
4. Bryaceæ.

Asexual reproduction often predominant by means of tetradidia.

Asexual reproduction often predominant by means of bulbils, or tubers, or special vegetative branches.

Asexual reproduction often predominant, by means of simple separation of the vegetative axis, by adventitious shoots or by gemmae.

Asexual reproduction predominant by the development of a protonema, more rarely through gemmae.

Perfect plant ♂ or ♀
Spermogonia.

1. Perfect plant ♂

2. Antheridium ♀

Spermata ♀

3. Spermatozoids motile

Perfect plant ♂ or ♀
Procaryp.

1. Perfect plant ♂

II. Oogonium

Trichogyne.

III. Oosphere.

Oöphyte Generation.

(Sexual Phase.)

Alternation of generations well defined.

1. Perfect plant ♂ or ♀

2. Antheridia ♀

3. Spermatozoids motile.

1. Perfect plant ♂ or ♀

II. Archegonium.

III. Oosphere (Ovum).

4 x IV. Oospore.

5 x V. Embryo rudimentary.

6 x VI. Sporogonium parasitic upon the sexual generation.

7 x VII. Spores with elaters.

8 x VIII. Protonema.

1. Perfect plant ♂ or ♀

2. Antheridia ♀

3. Spermatozoids motile.

1. Perfect plant ♂ or ♀

II. Archegonium.

III. Oosphere (Ovum).

4 x IV. Oospore.

5 x V. Embryo rudimentary.

6 x VI. Sporogonium parasitic on the sexual generation.

7 x VII. Spores

8 x VIII. Protonema.

III. Carpospores. 4 x IV. Oospore.

IV. Protonema. 5 x V. Pro-embryo.

Sporophyte Generation.

(Asexual Phase)

Alternation of generations well defined.

Oophyte Generation.
(Sexual Phase.)
Sporophyte Generation
(Asexual Phase.)
Alternation of generations often well defined.

XII.—FILICINÆ.
(Ferns.)

A. Leptosporangiate.		B. Eusporangiate.
1. Homosporous.	2. Heterosporous.	3. Homosporous.
<i>Orders.</i> 1. Filices. Asexual reproduction wholly subordinate; when present, chiefly by extension and division of the main axis, more rarely by bulbs or by stoloniferous fronds, or even by apogamy.	<i>Orders.</i> 1. Salviniaceæ. 2. Marsiliaceæ. Asexual reproduction wholly subordinate.	<i>Orders.</i> 1. Ophioglossaceæ. 2. Marattiaceæ. Asexual reproduction subordinate, by means of adventitious buds on the roots.
1. Prothallus ♂ well formed. 2. Antheridium ♂ 3. Spermatozoids motile.	1. Prothallus ♂ well formed. 2. Antheridium. 3. Spermatozoids.	1. Prothallus ♂ well formed. 2. Antheridium ♂ 3. Spermatozoids motile.
I. Prothallus ♂ well formed. II. Archegonia ♀	I. Prothallus ♂ well formed. II. Archegonia.	I. Prothallus ♂ well formed. II. Archegonia ♀
III. Oosphere (Ovum.)	III. Oosphere (Ovum)	III. Oosphere (Ovum)
4 x IV. Oospore. 5 x V. Embryo rudimentary. 6 x VI. Normal plant. 7 x VII. Sporophyll. 8 x VIII. Sporangia. 9 x IX. Spores.	4 x IV. Oospore. 5 x V. Embryo rudimentary. 6 x VI. Normal plant. 7 x VII. Sporocarp. 8 x VIII. Sporangia ♂ and ♀ 9 x IX. Spores ♂ and ♀	4 x IV. Oospore. 5 x V. Embryo rudimentary. 6 x VI. Normal plant. 7 x VII. Sporophyll. 8 x VIII. Sporangia. 9 x IX. Spores.

XIII.—EQUISETINÆ.
(Horse-tails.)

Homosporous.	Heterosporous.
<i>Orders.</i> 1. Equisetaceæ. 2. Calamitæ (?) Asexual reproduction subordinate by means of tubers.	<i>Orders.</i> 1. Annulariæ 2. Asterophyllitæ Represented by strobili forms only. In succession as in heterosporous Lycopodiaceæ.
1. Prothallus ♂ well developed. 2. Antheridium ♂ 3. Spermatozoids motile.	
I. Prothallus ♂ well developed. II. Archegonium ♀	
III. Oosphere (Ovum)	
4 x IV. Oospore. 5 x V. Embryo rudimentary. 6 x VI. Normal plant 7 x VII. Scales of fertile spike. 8 x VIII. Sporangia. 9 x IX. Spores with elaters.	

phyta.

infect Vascular System.
(ptogams.)
ordinate.

NOTES.

XIV. SPHENOPHYLLACE.	XV. LYCOPODINE. (Club Mosses.)			
Heterosporous.	Homosporous or Heterosporous, the latter fossil only.	Homosporous.	Heterosporous.	
<i>Order.</i>	<i>Order.</i>	<i>Order.</i>	<i>Orders.</i>	
Sphenophyllaceæ.	<p>I. Lycopodiaceæ.</p> <p>Asexual reproduction subordinate, by means of axillary bulbils, or by lateral budding of underground tubers.</p>	<p>I. Psilotaceæ.</p> <p>Sexual reproduction predominant.</p>	<p>1. Selaginellaceæ. 2. Isoetaceæ.</p> <p>Asexual propagation subordinate, by division of the main axis, rarely by apogamy.</p>	
Represented by fossil forms only. The succession as in the heterosporous Lycopodinae.	<p>I. Prothallus ♂ or ♀ rudimentary. 2. Antheridium ♀ 3. Spermatozoids motile.</p>	<p>I. Prothallus ? rudimentary. 2. Antheridium ? 3. Spermatozoids motile.</p>	<p>1. Prothallus ? rudimentary. 2. Antheridium. 3. Spermatozoids motile.</p>	
	<p>I. Prothallus ♂ or ♀ rudimentary. II. Archegonium ♀ III. Oosphere (Ovum).</p>	<p>I. Prothallus ? rudimentary. II. Archegonium ? III. Oosphere (Ovum).</p>	<p>I. Prothallus ? rudimentary. II. Archegonium. ? III. Oosphere (Ovum).</p>	
	<p>4 x IV. Oospore. 5 x V. Suspensor. 6 x VI. Embryo rudimentary. 7 x VII. Normal plant. 8 x VIII. Sporangiferous leaf. 9 x IX. Sporangium. 10 x X. Spores.</p>	<p>4 x IV. Oospore. 5 x V. Suspensor. 6 x VI. Embryo rudimentary. 7 x VII. Normal plant. 8 x VIII. Sporangiferous leaf. 9 x IX. Sporangium. 10 x X. Spores.</p>	<p>4. Oospore. 5. Suspens. r. 6. Embryo rudimentary. 7. Normal plant. 8. Sporangiferous leaf. 9. Microsporangia. 10. Microspores.</p> <p>IV. Oospore. V. Suspensor. VI. Embryo rudimentary. VII. Sporangiferous leaf. VIII. Normal plant. IX. Macrosporangia. X. Macrospores.</p>	



BRANCH V.—Spermaphyta.

True seed plants.

Sexual generation very subordinate, in the Dicotyledons becoming almost completely suppressed with respect to the general structure.

NOTES.

XVI.—GYMNOSPERMÆ. Carpels open, seeds naked.	XVII.—ANGIOSPERMÆ. Carpels forming closed seed vessels.	
Heterosporous; prothalli two ♂ ♀.	Heterosporous, the rudimentary prothalli often wanting.	
Orders.	1. Monocotyledons.	2. Dicotyledons.
1. Cycadaceæ. 2. Coniferae. 3. Taxaceæ. 4. Gnetaceæ. Asexual propagation subordinate; sometimes by tubers.	Orders numerous. Asexual propagation subordinate, rarely wholly replacing the sexual; varied, by means of runners, stolons, offsets, bulbs, suckers, tubers, and rarely by parthenogenesis.	Orders numerous.
1. Prothallus rudimentary. ♂ 2. Antheridium rudimentary. (Pollen tube.) 3. Spermatozoids none. (Protoplasm of the antheridium.)	1. Prothallus not developed. 2. Antheridium rudimentary. (Pollen tube.) 3. Spermatozoids none. (Protoplasm of the antheridium.)	1. Prothallus not developed. ♂ 2. Antheridium rudimentary. (Pollen tube.) 3. Spermatozoids none. (Protoplasm of the antheridium.)
I. Prothallus ♀ (endosperm), formed before impregnation; parasitic upon the asexual generation. (Seeds albuminous.) II. Archegonium well formed. III. Oosphere (Ovum.)	I. Prothallus ♀ (endosperm), formed only after impregnation of the ovum; parasitic upon the asexual generation. (Seeds albuminous.) II. Archegonium not formed. III. Oosphere (Ovum. Germ cell.)	I. Prothallus ♀ (endosperm) formed only after impregnation of the ovum, generally obliterated. (Seeds exalbuminous.) II. Archegonium not formed. III. Oosphere (Ovum or Germ cell.)
4. Oospore. 5. Suspensor. 6. Embryo with 2 to several cotyledons. 7. Normal plant. 8. Anthophylla. 9. Microsporangia (Anthers.) 10. Microspores (Pollen.)	4. Oospore. 5. Suspensor. 6. Embryo with one cotyledon. 7. Normal plant. 8. Stamens. 9. Microsporangia (Anthers.) 10. Microspores. (Pollen.)	4. Oospore. 5. Suspensor. 6. Embryo with two cotyledons. 7. Normal plant. 8. Stamens. 9. Microsporangia (Anthers.) 10. Microspores. (Pollen.)
IV. Oospore. V. Suspensor. VI. Embryo with 2 to several cotyledons. VII. Normal plant. VIII. Carpophyllum. IX. Macrosporangia (Ovules.) X. Macrospore (Embryo sac.)	IV. Oospore. V. Suspensor. VI. Embryo with one cotyledon. VII. Normal plant. VIII. Pistil. IX. Macrosporangia (Ovules.) X. Macrospore (Embryo sac.)	IV. Oospore. V. Suspensor. VI. Embryo with two cotyledons. VII. Normal plant. VIII. Pistil. IX. Macrosporangia (Ovules.) X. Macrospore (Embryo sac.)